

Quality is more than a word

ESPEC

# Thermal Shock Chamber

TSD-100  
TSE-11-A



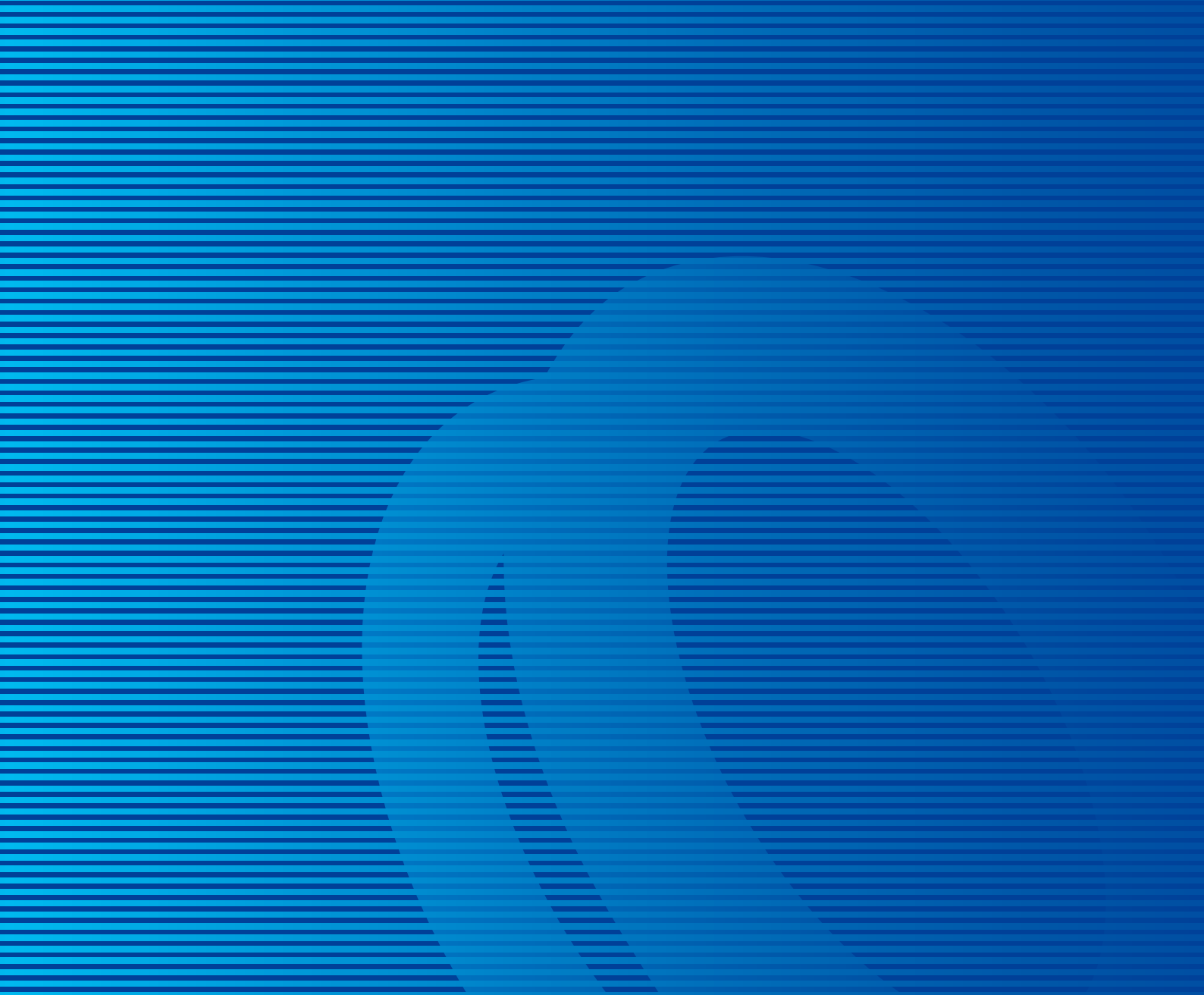
# Two-zone chamber capable of exposing specimens to a uniform thermal stress.

These two-zone thermal shock chambers are designed to specifically meet the needs of MIL, IEC, JASO, and other international testing standards.

Choose either the TSD model with 100L capacity, or the TSE model for compact, small-volume testing.

Uniform thermal stress is applied to specimens, which these models guarantee the perfect thermal shock test for anything from R&D to inspection and production applications.





# Performance

## Reduced test time by means of test area transfer

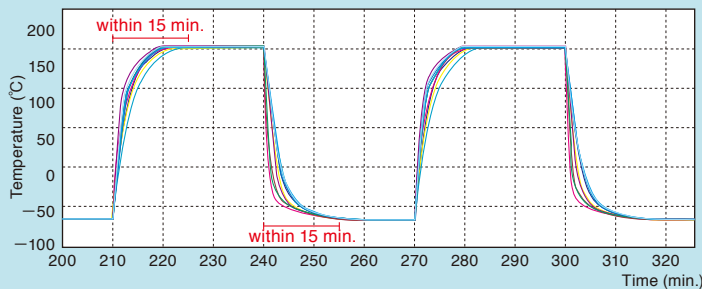
### ● TSD Specimen temperature recovery (e.g.) (based on MIL-STD-883 condition C)

#### Test conditions

High temp. exposure: +155°C for 30 min.  
Low temp. exposure: -68°C for 30 min.  
Specimens: ICs, 10 kg

#### Temperature uniformity measurement method

Thermocouples were embedded in 10 ICs placed on two levels in each of the corners and in the center of a specimen basket. (Specimens with embedded thermocouples were placed beneath other ICs.)



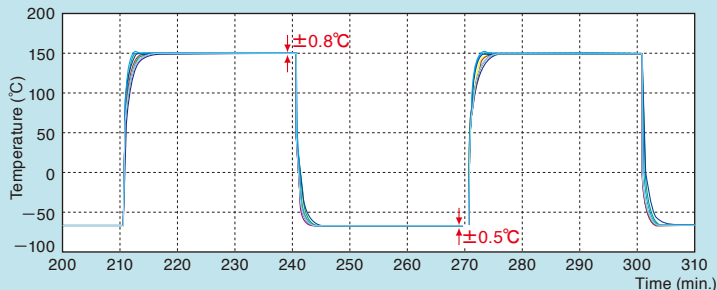
### ● TSD Temperature uniformity performance (e.g.)

#### Test conditions

High temp. exposure: +150°C for 30 min.  
Low temp. exposure: -65°C for 30 min.  
Specimens: ICs (×10)

#### Temperature uniformity measurement method

Thermocouples were attached to the surface of 10 ICs placed on two levels in each of the corners and in the center of a specimen basket.



### ● Temperature recovery time shortened

A temperature recovery time of less than 5 minutes is achieved in 2 zones. (TSE)  
During testing of 10 kg of plastic molded ICs, at temperature settings of +150°C and -65°C, the specimen temperature recovers in less than 15 minutes. (TSD)

### ● Meets International standards

Designed to comply with major environmental test standards like MIL, IEC, JASO, JEITA. (p.6-8)

### ● Improved temperature uniformity performance

Airflow in the test area is dispersed uniformly for outstanding temperature distribution.

The result is uniform thermal stress applied to specimens for minimal deviation between specimen test results.

### ● Smooth specimen transfer

The “Soft-move mode” is used to reduce vibration shocks when specimens are moving between the high and low temperature chambers.

### ● Test area anti-drop mechanism to protect specimens

A braking system fitted to the drive mechanism prevents specimens from falling into the test area when the chamber stops operation.

### ● Comprehensive safety system

A dual safety system automatically stops the test area drive mechanism if the door is left open, and automatically locks the door when the test area is in motion.



TSE High-temperature exposure



TSE Low-temperature exposure

# Utility

## ● Capacity

The TSD model secured a test area capacity of 100L, while the TSE model has a 10.9L test area capacity. Both models support testing of A4-size printed circuit boards laid flat.

## ● Easy wiring access

A cable port is provided on the right side to allow easy wiring of specimen for measurement during high and low temperature cycle tests.

## ● Specimen Temperature Trigger (STT) function

The TSD-100 chamber now includes a STT function. It monitors the specimen temperature using two sensors attached to the specimen and starts to count the exposure time, or proceeds to the next step once the specimen temperature reaches the preset temperature. This eliminates the need for pretesting, reducing the overall test time and ensures an accurate specimen temperature attainment. The specimen and test area temperatures can be recorded by connecting a temperature recorder. (TSD)

## ● Safe specimen handling thanks to ambient temperature recovery

An ambient temperature recovery feature is included to draw in exterior air after testing is complete and return to ambient temperature, allowing specimens to be removed safely. (TSD)

## ● Viewing window (option)

An optional viewing window can be added to check specimens and wiring during testing. The viewing window includes an interior lighting. (TSD)

## ● Casters allow easy relocation

Chamber casters allow easy rearrangement of equipment as required. (TSE: Standard, TSD: Option)



TSD Specimen temperature measurement  
(specimen temperature input standard equipment: 2 locations)  
optional: 3 locations



TSD Test areas (top: high temperature chamber  
bottom: low temperature chamber)



TSD Viewing window (option)

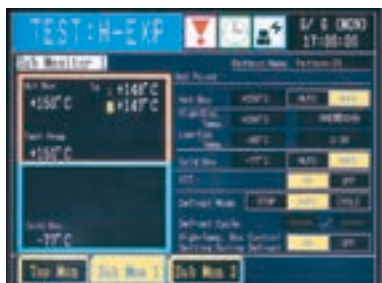
# Control operation



Instrumentation

## ● Test detail monitor

Test details are displayed while the test is in progress.



## ● Test setting

Displays the conditions to define for the test.



## ● Color LCD interactive touch-screen system

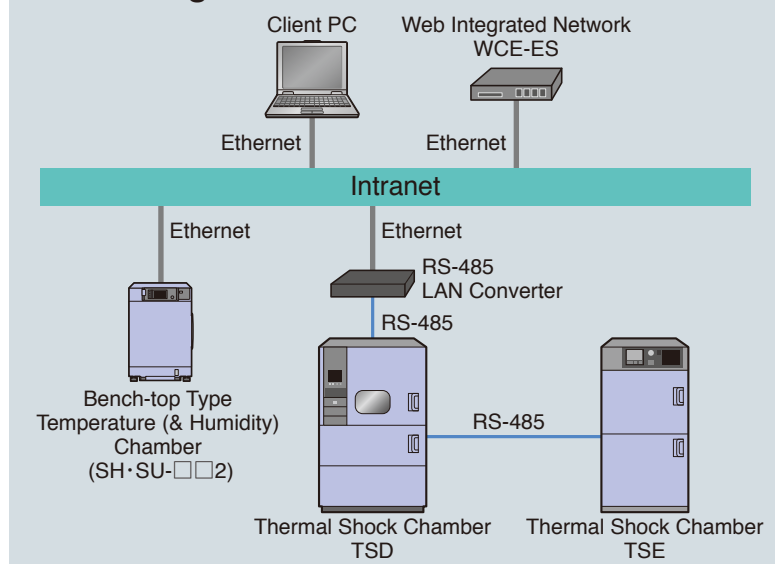
Operation and settings simplified by the use of a touch-screen LCD display (instructions displayed on-screen). At-a-glance confirmation of test patterns, test area temperatures, temperature cycles, upstream/ downstream control, and trend graph displays.

## ● Door-mounted instrumentation

Instrumentation including the touch-screen controller is incorporated into the door. It reduces the overall footprint and frees up both sides of the chamber for easy access. (TSD)

Display	TFT color LCD (6.5 inches)
Temperature control function	Test area: exposure temp. Hot chamber: pre-heating temp. Cold chamber: pre-cooling temp. Cold chamber: defrosting temp. PID control
Preset temperature range	(TSD) High temperature: +60 to +205°C Low temperature: -77 to 0°C (TSE) High temperature: +60 to +205°C Low temperature: -82 to 0°C
Setting resolution	1°C
Input	Thermocouple type T (Copper/Copper-Nickel)
Setting and indication ranges	Preset time: 0 min. to 99 hours and 59 min. Preset cycle: 1 to 9,999 cycles
Accessory functions	Timer preset, Test continuity selection, Overheat/ overcool protection, Upstream/ downstream sensor selection, STT (TSD), Temperature attainment control, Quick exposure control, Power failure/ recovery selection, Automatic defrost, Temperature recovery time setting, Program memory, Automatic power shut-off, Programmed time display, Test suspension, Test completion mode selection, Trend graph, Alarm history display, Sensor calibration, RS-485 communication

## ● Web Integrated Network



## ● Web Integrated Network (Sold separately)

It is possible to check the status of multiple chambers from a single screen (up to 100 chambers, web-compatible devices only).

This equipment includes a scheduler ideal for test management.

\* Please ask us for compatibility with other devices.

## TEST STANDARD (TSD-100 COMPATIBILITY)

Test standard		Temperature setting		Recovery time	Soak time	Number of cycles
		High temp. (°C)	Low temp. (°C)			
IEC 60749-25 (JESD22-A104-D)	A	+85 (+10, -0)	-55 (+0, -10)	Specimen 5 to 14 min.	1/ 5/ 10/ 15 min.	Not specified
	B	+125 (+15, -0)	-55 (+0, -10)	Specimen 5 to 14 min.		
	C	+150 (+15, -0)	-65 (+0, -10)	Specimen 5 to 29 min.		
	H	+150 (+15, -0)	-55 (+0, -10)	Specimen 5 to 14 min.		
	M	+150 (+15, -0)	-40 (+0, -10)	Specimen 5 to 15 min.		
IEC 60068-2-14 Na (JIS C 60068-2-14 Na DIN EN 60068-2-14 Na BS EN 60068-2-14 Na)		+200±2 +175±2 +155±2 +125±2 +100±2 +85±2 +70±2	-65±3 -55±3 -40±3 -25±3 -5±3	10% of soak time	3 hours 2 hours 1 hour 30 min. 10 min. 3 hours if not specified in product specifications	5
IEC-61747-5 Na (EIAJ ED-2531A Na)		+100±2 +95±2 +90±2 +85±2 +80±2 +75±2 +70±2 +65±2 +60±2	-50±3 -45±3 -40±3 -35±3 -30±3 -25±3 -20±3 -15±3 -10±3 -5±3 -0±3	10% of soak time	3 hours 2 hours 1 hour 30 min. 10 min. 3 hours if not specified in product specifications	5-10
MIL-STD-202 Method 107G	A	+85 (+3, -0)	-55 (+0, -3)	Upstream of specimen within 5 min.	28g and below: 15 min. 28 to 136g: 30 min. 136g to 1.36kg: 1 hour 1.36 to 13.6kg: 2 hours 13.6 to 136kg: 4 hours More than 136kg: 8 hours	5 25 50 100
	B	+125 (+3, -0)	-65 (+0, -3)			
	F	+150 (+3, -0)	-65 (+0, -5)			
MIL-STD-883 Method 1010.8	A	+85 (+10, -0)	-55 (+0, -10)	Specimen less than 15 min.	10 min. or longer after transition start	At least 10
	B	+125 (+15, -0)	-55 (+0, -10)			
	C	+150 (+15, -0)	-65 (+0, -10)			
	D	+200 (+15, -0)	-65 (+0, -10)			
	F	+175 (+10, -0)	-65 (+0, -10)			

## TEST STANDARD (TSD-100 COMPATIBILITY)

Test standard		Temperature setting		Recovery time	Soak time	Number of cycles
		High temp. (°C)	Low temp. (°C)			
IPC-TM-650 2.6.6	A	+ 125 (+3, −0)	− 65 (+0, −5)	————	30 min.	5
	B	+ 85 (+3, −0)	− 55 (+0, −5)			
SAE J1879		+ 150	− 55	Specimen less than 15 min.	10 min. or longer after transition start	1000
JASO-D001	Type 1	+ 85	− 40	Air 5 min.	0.2kg and below: 1 hour (+15 min.) 0.2 to 0.8kg: 2 hours (+15 min.) 0.8 to 1.5kg: 3 hours (+15 min.) More than 1.5kg: 4 hours (+15 min.)	6
	Type 2	+ 75				
	Type 3	+ 120				
	Type 4	Depends on parties involved				
JASO-D902	Type 1	+ 85	− 40	Air 5 min.	Within 5 min. after solder joint temp. reaches ±2°C of preset temp. Or, 0.2kg and below: 0.5 hours 0.2 to 0.8kg: 1 hour 0.8 to 1.5kg: 1.5 hours More than 1.5kg: 2 hours preset temp	200
	Type 2	Depends on parties involved				
EIAJ ED-4701		Max. storage temp.	Min. storage temp.	Air 5 min. or 10% of soak time, whichever is longer	15g and below: at least 10 min. 15 to 150g: at least 30 min. 150 to 1,500g: at least 60 min. More than 1,500g: individually specified	10
EIAJ ED-4702	A	+ 125 (±3)	− 65 (±3)	Air 5 min. or 10% of soak time, whichever is longer	30 min.	5 cycles unless otherwise specified
	B	+ 100 (±3)	− 65 (±3)			
	C	+ 100 (±3)	− 55 (±3)			
	D	Mounted printed circuit board max. operating temp.	Mounted printed circuit board min. operating temp.			
EIAJ ED-7407	A	+ 125±5	− 25±5	————	7 min. after specimen temperature attainment	————
	B	+ 125±5	− 40±5			
	C	+ 80±5	− 30±5			
	D	Max. operating temp.	Min. operating temp.			

## TEST STANDARD (TSE-11-A compliant)

Test standard		Exposure temperature			Exposure time		Temp. recovery time	Number of cycles	Test starting point
		High temp.	Ambient temp.*	Low temp.	High/low temp.	Ambient temp.*			
MIL-STD-883H (Method No. 1010.8)	A	+ 85°C <sup>+10</sup> <sub>0</sub>	—	— 55°C <sup>0</sup> <sub>−10</sub>	more than 10 min.	—	Specimen temp within 15 min. at worst condition	Minimum 10 cycles	Low or high temp.
	B	+ 125°C <sup>+15</sup> <sub>0</sub>							
	C	+ 150°C <sup>+15</sup> <sub>0</sub>							
	D	+ 200°C <sup>+15</sup> <sub>0</sub>		— 65°C <sup>0</sup> <sub>−10</sub>					
	F	+ 175°C <sup>+15</sup> <sub>0</sub>							
IEC 60068-2-14 (JIS C 60068-2-14)		+ 70°C <sup>±2</sup> + 85°C <sup>±2</sup> + 100°C <sup>±2</sup> + 125°C <sup>±2</sup> + 155°C <sup>±2</sup> + 175°C <sup>±2</sup> + 200°C <sup>±2</sup>	Ambient temp.	— 5°C <sup>±3</sup> — 10°C <sup>±3</sup> — 25°C <sup>±3</sup> — 40°C <sup>±3</sup> — 55°C <sup>±3</sup> — 65°C <sup>±3</sup>	3 hours 2 hours 1 hour 0.5 hour 3 hours if not specified	less than 10 sec.	less than 10% of exposure time	5 cycles if not specified	Low temp.
JASO D 001	1	+ 85°C	Ambient temp.	— 40°C	Less than 0.2 kg 1 hour <sup>+15 min.</sup> <sub>0</sub>	Short exposure is recommendable	Upstream of specimen within 5 min.	6 cycles	High temp.
	2	+ 75°C			0.2~0.8 kg 2 hours <sup>+15 min.</sup> <sub>0</sub>				
	3	+ 120°C			0.8~1.5 kg 3 hours <sup>+15 min.</sup> <sub>0</sub> More than 1.5 kg 4 hours <sup>+15 min.</sup> <sub>0</sub>				
EIAJ ED-2531A		+ 60°C <sup>±2</sup> + 65°C <sup>±2</sup> + 70°C <sup>±2</sup> + 75°C <sup>±2</sup> + 80°C <sup>±2</sup> + 85°C <sup>±2</sup> + 90°C <sup>±2</sup> + 95°C <sup>±2</sup> + 100°C <sup>±2</sup>	Ambient temp.	0°C <sup>±3</sup> — 5°C <sup>±3</sup> — 10°C <sup>±3</sup> — 15°C <sup>±3</sup> — 20°C <sup>±3</sup> — 25°C <sup>±3</sup> — 30°C <sup>±3</sup> — 35°C <sup>±3</sup> — 40°C <sup>±3</sup> — 45°C <sup>±3</sup> — 50°C <sup>±3</sup>	3 hours 2 hours 1 hour 0.5 hour 3 hours if not specified	less than 10 sec.	less than 10% of exposure time	5 or 10 cycles	Low temp.

■ The above specification tests include only those tests applicable to TSE-11-A. For further information, please contact us.

\* Ambient temperature at exposure temperature and exposure time represents the temperature and time when moving from hot chamber to cold chamber.

## SPECIFICATIONS

Model			TSD-100				
System			2-zone transition by vertical transfer of specimens				
Performance *1	Test area	High temp. exposure range	+ 60 to +200℃ (+140 to +392℉)				
		Low temp. exposure range	− 65 to 0℃ (− 85 to +32℉)				
		Temp. fluctuation *2	±1.0℃				
	Hot chamber	Pre-heat upper limit	+205℃				
		Temp. heat up time *3	Ambient temp. to +200℃ within 90 min.				
	Cold chamber	Pre-cool lower limit	−77℃				
		Temp. pull down time *3	Ambient temp. to −77℃ within 90 min.				
	Temp. recovery (2-zone)	Recovery conditions *4	2-zone • High temp. exposure: +150℃ 30 min. • Low temp. exposure: −65℃ 30 min. • Sensor position: downstream • Specimen: Plastic molded ICs, 10kg				
		Temp. recovery time	Specimen IC temp. within 15 min.				
	Ambient recovery	Recovery conditions	• High temp. exposure: +150℃ to max. +55℃ • Ambient temp.: +23℃ • Specimen: Plastic molded ICs, 10 kg				
Ambient temp. recovery time		Within 90 min.					
Construction	Refrigeration unit	System	Mechanical cascade refrigeration system (water-cooled condenser)				
		Refrigerator	Scroll-type compressor				
		Expansion mechanism	Electronic expansion valve				
		Refrigerant	R404A, R23				
Cooler			Plate fin cooler and cold accumulator				
Elevating unit			Power slider (250W)				
Fittings			Cable port ID ϕ 100mm (×1) on right side (left side available as option), specimen power supply control terminal, time signal (×2), integrating hour meter, specimen temperature input terminal (×2)				
Test area load resistance *5			30 kg				
Inside dimensions			W710×H345×D410 mm (W27.95×H13.58×D16.14 inch)				
Test area capacity			100 L				
Outside dimensions *6			W1100×H1885×D1965 mm (W43.31×H74.21×D77.36 inch)				
Weight			Approx. 1100 kg				
Utility requirements	Allowable ambient conditions		+5 to +40℃ (+41 to +95℉)				
	Power supply (Voltage fluctuation: rating ±10%)		200V AC 3ϕ 50/60Hz	208V AC 3ϕ 60Hz *7	220V AC 3ϕ 60Hz	380V AC 3ϕ 50Hz	400/415V AC 3ϕ 50Hz *8
	Maximum load current		64 A	62 A	58 A	34 A	32 A
	Cooling water supply pressure *9		0.2 to 0.5 Mpa (2 to 5 kg/ cm <sup>2</sup> G)				
	Cooling water supply rate *10		2050L/ h (at reference water temp. +25℃), 3400L/ h (at reference water temp. +32℃)				
	Piping connection size		Carbon steel pipe, ID 32 mm				
	Operating cooling water temp. range		+5 to +38℃ (+41 to +100℉)				
Noise level *11			Max. 65 dB				
Exhaust heat quantity			12600 kJ/h (3000 kcal/h)				
Exhaust rate			250 m <sup>3</sup> /h				

<sup>\*1</sup> Under the conditions of a +23°C ambient temperature, cooling water temperature +25°C, rated voltage, and no specimen inside the test area.

<sup>\*2</sup> The performance values are based on IEC 60068-3-5:2001, JTM K07:2007.

<sup>\*3</sup> When each chamber is operated independently

<sup>\*4</sup> Setting: High temp. exposure +155°C, low temp. exposure −68°C

<sup>\*5</sup> When using the test area floor or heavy-duty shelves (option)

<sup>\*6</sup> Excluding protrusions

<sup>\*7</sup> This model complies with the requirements of the National Electric Code (NFPA 70) for the United States of America (NEC spec.)

<sup>\*8</sup> This model complies with the requirements of the European Community Directives (CE spec.)

<sup>\*9</sup> A pressure regulator valve is required if the pressure exceeds 0.5MPa (5kg/cm<sup>2</sup>G)

<sup>\*10</sup> Rate depends on the cleanliness of the heat exchanger

<sup>\*11</sup> Measurements are to be taken in an anechoic room at a height of 1.2m from the floor, and a distance of 1m from the front panel (ISO 1996-1: 2003.A-weighted sound pressure level)

## SAFETY DEVICES

- Leakage breaker (200, 220, 380V AC)
- Circuit breaker (208, 400/415V AC)
- Electrical compartment door switch
- Hot chamber overheat protection switch
- Cold chamber overheat protection switch
- Hot chamber overheat protectors  
(Built into temperature controller)
- Cold chamber overheat/ overcool protectors  
(Built into temperature controller)
- Test area overheat/ overcool protectors  
(Built into temperature controller)
- Test area overheat/ overcool protectors
- Circuit breaker
- Refrigerator high/ low pressure switch
- Compressor built-in protector
- Temperature switch for compressor
- Water suspension relay
- Temperature switch for air circulator
- Air circulator thermal relay
- Motor inverter
- Motor reserve prevention relay
- Hot chamber door switch
- Cold chamber door switch
- Door lock mechanisms
- Cartridge fuse
- Specimen power supply control terminal
- Cooling tower interlock terminal

## ACCESSORIES

- Specimen basket  
(18-8 Cr-Ni stainless steel: 5 mesh metal basket)  
W700×H40×D410 mm/ load capacity 5kg ..... 2
- Shelf brackets ..... 2 sets
- Cartridge fuse (1A, 7A, 10A, 15A) ..... 4
- Cable port rubber plug ..... 2
- Perforated cable port cap ..... 1
- Wire fisher (specimen wiring tool) ..... 1
- Thermocouple ..... 2
- Specimen temperature input connector ..... 2
- 3-pole socket (208V AC spec. only) ..... 3
- Nipple R1 1/4 in. (32 mm) ..... 1
- Strainer R1 1/4 in. (32 mm) ..... 1
- Strainer element R1 1/4 in. (32 mm) ..... 1
- Operation manual ..... 1

## SPECIFICATIONS

Model			TSE-11-A			
System			2-zone transition by vertical transfer of specimen			
Performance *1	Test area	High temp. exposure range	+ 60 to +200°C (+140 to +392°F)			
		Low temp. exposure range	− 65 to 0°C (−85 to +32°F)			
		Temperature fluctuation *2	±0.5°C			
	Hot chamber	Pre-heat upper limit	+ 200°C			
		Temp. heat-up time *3	Ambient temp. to +200°C within 30 min.			
	Clod chamber	Pre-cool lower limit	−80°C			
		Temp. pull-down time *3	Ambient temp. to −80°C within 90 min.			
	Temp. recovery	Recovery conditions	· 2 zones High temperature exposure: +150°C, 30 min. Low temperature exposure: −65°C, 30 min. · Sensor position: Upstream · Specimen: Plastic molded ICs 2 kg			
Temp. recovery time		within 5 min.				
Construction	Test area		Shelf brackets on 2 levels of fixed location			
	Heater		Stripped wire heater			
	Refrigeration unit	System	Mechanical cascade refrigeration system			
		Compressor	Rotary 1.5 kW ×2			
		Refrigerant	R508A R404A			
		Condenser	Air-cooled condenser			
	Cooler		Plate fin cooler, cold accumulator			
Fittings			Specimen power supply control terminal, integrating hour meter without reset, time signal (2), cable port 50 mm, (right side), casters with leveling feer (4), power cable			
Test area load resistance			8 kg			
Specimen basket load capacity			2kg per basket (equally distributed load)			
Inside dimensions (W×H×D)			320×148×230mm (12.6×5.8×9 inch)			
Test area capacity			10.9 L			
Outside dimensions (W×H×D) *4			680×1625×1050mm (26.8×64×41.3 inch)			
Weight			approximately 390kg			
Allowable ambient conditions			0 to +40°C (+32 to +104°F)			
Power supply (Voltage fluctuation: rating ±10%)			200V AC 3ϕ 3W 50/60Hz	220V AC 3ϕ 3W 60Hz	380V AC 3ϕ 4W 50Hz	400/415V AC 3ϕ 4W 50Hz *5
Maximum load current			26A	25A	17A	17A
Exhaust heat quantity *6			17,585kJ/h			
Noise level *7			60dB or less			

<sup>\*1</sup> The performance values are under the conditions of a +23°C ambient temperature, relative humidity of 65%rh, rated voltage, and no specimen. Heat up time and pull down time are those of single-unit operation of each chamber.

<sup>\*2</sup> The performance values are based on IEC60068-3-5:2001, JTM K07:2007.

<sup>\*3</sup> Temperature heat-up/pull-down time account for performance of each temperature chamber.

<sup>\*4</sup> Excluding protrusions.

<sup>\*5</sup> Compliance with CE Marking.

<sup>\*6</sup> At ambient temperature +23°C.

<sup>\*7</sup> At 1m from front of chamber, 1.2m from floor. (ISO 1996-1:2003 A-weighted sound pressure level) depending on environment

## SAFETY DEVICES

- Leakage breaker (200, 220, 380V AC)
- Circuit breaker (400 / 415V AC)
- Electrical compartment door switch
- Hot chamber overheat protection switch
- Cold chamber overheat protection switch
- Hot chamber overheat protector (Controller)
- Cold chamber overheat / overcool protectors (Controller)
- Test area overheat and overcool protectors (Built-in controller)
- Test area overheat / overcool protectors
- Refrigerator high pressure switch
- Thermal relay for compressor
- Temperature switch for compressor
- Temperature switch for air circulator
- Thermal relay for air circulator
- Motor inverter
- Motor reverse prevention relay
- Hot chamber door switch
- Cold chamber door switch
- Test area hold
- Door lock mechanisms
- Fuse
- Specimen power supply control terminal

## ACCESSORIES

- Specimen basket  
(18-8 Cr-Ni stainless steel, 5 mesh metal basket)  
W320×H35×D230mm  
Load capacity: 2kg (equally distributed) ..... 2
- Cartridge fuse (5A) ..... 1
- Cable port rubber plug ..... 2
- Wirefisher ..... 1
- User's manual (CD-R, booklet) ..... 1 set



### Safety precautions

- Do not use specimens which are explosive or inflammable, or which contain such substances. To do so could be hazardous, as this may lead to fire or explosion.
- Do not place corrosive materials in the chamber. If corrosive substances or humidifying water is used, the life of the unit may be significantly shortened.
- Do not place life forms or substances that exceed allowable heat generation.
- Always read the operation manual before using the Product.

## OPTIONS

### Power cable



- 5 m
- 10 m

\* Not applicable for optional 208, 380 and 400/415V AC power supply specification.

### Viewing window



Used for observation of the specimens inside the chamber.

Dimensions: W190×H340 mm

Chamber lamp: Halogen lamp (×1)



### Specimen basket/ shelf bracket



Equivalent to standard accessory.  
Material: Stainless steel (5 mesh)  
〈TSD〉

Load capacity: 5kg



〈TSE〉

Load capacity: 2kg



### Heavy-duty shelf

TSD

Used to hold heavy specimen exceeding the load capacity of the standard specimen basket.

Load capacity: 15 kg

\* Equally distributed load, not included shelf brackets and specimen baskets.

### Additional cable port

TSD

Provided in addition to the standard cable port. (right side)

Location: Left side of the main unit

Internal diameter: 100 mm

### Cable port rubber plug

Prevents air leakage from the cable port.

### Interface



- RS-232C
- GPIB

\* Select one, instead of standard RS-485.

### Paperless recorder



Records temperature of each section such as the temperature inside the chamber. Select either built-in or portable type. (TSD)

Number of inputs (Initial setting):

- 1 (5 more channels can be turned ON)  
Data saving cycle: 1 sec
- 3 (3 more channels can be turned ON)  
Data saving cycle: 1 sec
- 3 (3 more channels can be turned ON)  
Data saving cycle: 5 sec
- 5 (1 more channels can be turned ON)  
Data saving cycle: 1 sec
- 5 (1 more channels can be turned ON)  
Data saving cycle: 5 sec
- 6 Data saving cycle: 1 sec
- 6 Data saving cycle: 5 sec

Temperature range: -100 to +220°C

External memory media:

CF memory card (256MB)

USB port

Language support: ENG, JPN



Built-in type



Portable type

### Temperature recorder (digital)

-100 to +220°C /100 mm

- RK-61: 1 pen
- RK-63: 3 pens
- RK-64: 6 dots



### Recorder wiring

Preparation of a power cable, temperature sensor, and a grounding wire for additional installation in the future.

## OPTIONS

### Recorder terminal

TSE

Used to output the temperature within test area, hot chamber, cold chamber.

### Thermocouple

Attached to specimens to measure specimen temperature.

〈TSD〉

Thermocouple type T without ball (Copper/ Copper-Nickel)

〈TSE〉

T JIS C1602 with ball attached

- 2 m
- 4 m
- 6 m

### STT 3-point expansion

TSD

3 thermocouples provided to measure the specimens' temperature via the STT function (2 inputs are equipped as standard.)

### Exposure signal output

TSD

A signal is output via a contact switch when test area temperature is within the user-selected range. This signal can be used to control peripheral instruments, like applying a voltage to specimens only during high temperature exposure, or monitoring test operation from a remote point.

### Total cycle counter

Indicates cycle counts.

Display range: 1-99999999

(with resetting function)



### Auxiliary cooling injector (LCO<sub>2</sub>)



Used to reduce the temperature recovery time of low temperature exposure by injecting liquefied carbon dioxide at beginning of exposure.

### Auxiliary cooling injector (LN<sub>2</sub>)

Used to reduce the temperature recovery time of low temperature exposure by injecting liquefied nitrogen at beginning of exposure.

### Additional overhear protector



Additional preventive measures can be taken for excessive temperature rise in the chamber, in addition to the standard equipped double overhear protector.

### External alarm terminal

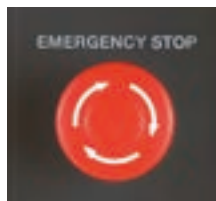
If the safety device of the chamber is activated, the external alarm terminal will notify it to a remote point.



TSD

### Emergency stop pushbutton

Stops the chamber immediately.



### Anchoring fixtures

Used to bolt the chamber to the floor.

### Chamber dew tray

Prevents water leaks from the chamber onto the floor.

\* The use of casters is recommended to facilitate operation.

### Castors

TSD

Installed for mobility.

Castors: 6

levelling-feet: 4

### Color specification

TSE

Chamber can be painted to any desired color. (a color sample is required)

### Reports & certificates

- Testing and inspection report
- Test data
- Calibration report
- Calibration certificate
- Traceability system chart
- Traceability certificate

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**ISO 9001/JIS Q 9001**

**Quality Management System Assessed and Registered**

ESPEC CORP. has been assessed by and registered in the Quality Management System based on the International Standard ISO 9001:2008 (JIS Q 9001:2008) through the Japanese Standards Association (JSA).

\* Registration : ESPEC CORP.  
(Overseas subsidiaries not included)



**ISO 14001 (JIS Q 14001)**

**Environmental Management System Assessed and Registered**

ESPEC CORP.